ToxFAQs™
for
Nerve Agents (GA, GB, GD, VX)

(Agentes que Afectan los Nervios (GA, GB, GD, VX))

CAS# Tabun (GA) 77-81-6
Sarin (GB) 107-44-8
Soman (GD) 96-64-0
VX 50782-69-9

This fact sheet answers the most frequently asked health questions about nerve agents. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to nerve agents can occur due to accidental release from a military storage facility. Nerve agents are highly toxic regardless of the route of exposure. Exposure to nerve agents can cause tightness of the chest, excessive salivation, abdominal cramps, diarrhea, blurred vision, tremors, and death. Nerve agents (GA, GB, GD, VX) have been identified at 5 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are nerve agents GA, GB, GD, and VX?

Nerve agents GA (tabun), GB (sarin), GD (soman), and VX are manufactured compounds. The G-type agents are clear, colorless, tasteless liquids miscible in water and most organic solvents. GB is odorless and is the most volatile nerve agent. GA has a slightly fruity odor, and GD has a slight camphor-like odor. VX is a clear, amber-colored odorless, oily liquid. It is miscible with water and dissolves in all solvents. VX is the least volatile nerve agent.

Most of the nerve agents were originally produced in a search for insecticides, but because of their toxicity, they were evaluated for military use. Nerve agents have been used in wars and by terrorists. They are known to be stored by several nations, including the United States.

What happens to nerve agents GA, GB, GD, and VX when they enter the environment?

- Nerve agents GA, GB, GD, and VX could enter the environment from an accidental release.
- When released to air, GA, GB, GD, and VX will be broken down by compounds that are found in the air, but they may persist in air for a few days before being broken down.
- GA, GB, GD, and VX will be broken down in water quickly, but small amounts may evaporate.
- GA, GB, GD, and VX will be broken down in moist soil quickly. Small amounts may evaporate into air or travel below the soil surface and contaminate groundwater.
- GA, GB, GD, and VX do not accumulate in the food chain.

How might I be exposed to nerve agents GA, GB, GD, and VX?

- The United States no longer produces nerve agents GA, GB, GD, and VX.
- The general population will not be exposed to nerve agents GA, GB, GD, or VX unless there is an accidental release from a military storage facility.
- People who work at military sites where these compounds are stored may be potentially exposed to nerve agents GA, GB, GD, and VX.

How can nerve agents GA, GB, GD, and VX affect my health?

Even in very small amounts, nerve agents are highly toxic if you inhale or swallow them, or if they come in contact with your skin or eyes. In general, the manifestation of toxic effects is faster if you inhale or swallow nerve agents than if they contact your skin. The initial effects also depend on the amount you are exposed to. The onset of mild to moderate effects after dermal exposure may be delayed for as long as 18 hours.

Regardless of the route of exposure, the manifestation of nerve agent exposure includes runny nose, chest tightness, pinpoint pupils, shortness of breath, excessive salivation and sweating, nausea, vomiting, abdominal cramps, involuntary defecation and urination, muscle twitching, confusion, seizures, paralysis, coma, respiratory paralysis, and death. Incapacitating effects occur within 1 to 10 minutes and fatal effects can occur within 1 to 10 minutes for GA, GB, and GD, and within 4 to 18 hours for VX.

Fatigue, irritability, nervousness, and memory defects may persist for as long as 6 weeks after recovery from an exposure episode.

We do not know if exposure to the nerve agents GA, GB, GD, or VX might result in reproductive effects in humans.

How likely are nerve agents GA, GB, GD, and VX to cause cancer?

The Department of Heath and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified GA, GB, GD, and VX as to their carcinogenicity to humans. Limited data in animals indicate that nerve agents are not likely to be carcinogenic.

How can nerve agents GA, GB, GD, and VX affect children?

Children exposed to nerve agents are likely to experience the same toxic effects experienced by exposed adults. We do not know whether children differ from adults in their susceptibility to nerve agents.

We do not know if exposure to the nerve agents GA, GB, GD, or VX might result in developmental effects in humans.

How can families reduce the risk of exposure to nerve agents GA, GB, GD and VX?

It is unlikely that the general population will be exposed to nerve agents.

Is there a medical test to show whether I've been exposed to nerve agents GA, GB, GD, and VX?

There are medical tests available to determine whether you have been exposed to nerve agents. There are tests to measure degradation products of nerve agents in the urine, but are not generally useful. A different kind of test measures the levels of a substance called cholinesterase in the blood. If these levels are less than half what they should be, and you were exposed to nerve gases, you may get symptoms of poisoning. Cholinesterase levels in the blood can stay low for months after you have been exposed to nerve agents. Measurement of cholinesterase levels in blood is not specific for exposure to nerve agents.

Has the federal government made recommendations to protect human health?

An Airborne Exposure Limit (as recommended by the Surgeon General's Working Group, U.S. Department of Health and Human Services) of 0.003 micrograms of GA, GB, GD, or VX per cubic meter of air (0.003 $\mu g/m^3$) has been established as a time-weighted

average (TWA) for the workplace.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Managing Hazardous Materials Incidents. Volume III – Medical Management Guidelines for Acute Chemical Exposures: Nerve Agents (GA, GB, GD, VX). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

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